Overconfident and Underprepared: Assessment of First-Year Undergraduate Students' Information Literacy Skills

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ABSTRACT

College students entering their first year at a small, private liberal arts college do so with varying levels of information literacy (IL) skills. With some evidence that first-year students tend to overestimate their skills, we created an instrument to measure both the students' confidence levels with various IL-related activities as well as their ability to demonstrate their knowledge of the skills themselves. After gathering the results from 159 participants during their first semester, we found that while 90% of students self-ranked their IL abilities as medium to high, 64% of participants failed the skills assessment portion of the test. Fifty-eight percent of this sample were overconfident, while 35% correctly self-ranked their skills, and 7% under-rated their abilities. This indicates to us that students are not arriving prepared for the expectations placed on them in college-level courses. As a result, we should frame our information literacy instruction in ways that acknowledge this gap, and help students to understand that they should learn new ways of doing research instead of relying on old habits.

ALISE RESEARCH TAXONOMY TOPICS AND AUTHOR KEYWORDS

academic libraries; education; students; information literacy; information needs; information seeking; reading and reading practices

1. INTRODUCTION

Information literacy (IL) is not only a graduate outcome for assessing an educational institution's effectiveness, its utility also contributes to students' academic success and research competency (Walker & Whitver, 2020). For IL instruction to be an effective factor in students' academic careers, assessment of the library's efforts becomes necessary. Demonstration of an academic library's value and capacity for delivering that value is essential.

At small, private liberal arts institutions, the contribution of the academic library must be quantified and communicated to its stakeholders, particularly in times of market disruptions confronting higher education today. When assessing its impact in IL instruction, academic libraries may under-investigate the prior knowledge first-year undergraduates hold. One approach to designing IL instruction is to fashion it from a top-down perspective, framing

instruction from the standpoint of outcomes and frameworks we know should be acquired by graduation. Without supporting literature, it may be all too easy to make inaccurate assumptions about the IL skills with which our first-year students are entering.

Prior studies have many accepting at face value that first-year students are overconfident in assessing their IL skills (Mahmood, 2016) and exhibit the Dunning-Kruger effect (Gross, Latham & Armstrong, 2012), or the inability to correctly assess one's own ability. Exploring barriers first-year students experience in their practice of information literacy, Hinchliffe, Rand & Collier (2018) note that first-year students believe they are information literate, think that every question has a single answer, and believe that freely-available online resources are adequate for their academic studies. Higher-order thinking skills such as synthesis and analysis are hampered by a lack of knowledge about the value of different types of information, leaving students less equipped to support their arguments and contribute to the scholarly conversation. Insua, Lantz & Armstrong (2018) note that students tend to perceive the research process as an activity of gathering sources rather than learning about a specific topic. Head (2013) reports the top 3 difficulties first-term, first-year students experience are: generating keywords to narrow down results, filtering and sorting among results, and identifying/selecting potential sources.

Reviewing studies examining first-year students and their IL skills prompted us to consider the foundational aspects of information literacy. Perceived adequacy is operationalized as the ability to identify source types, have a basic level of familiarity with citations, and demonstrate proficiency with basic search strategies.

2. MATERIALS AND METHODS

Individuals enrolled in a first-year experience course responded to our survey (n=172). Of those participants, 14 responses were dropped; of which eight were incomplete and five were under the age of consent. Among the 159 remaining respondents, 65% were female and 95% indicated they were first-year undergraduates.

At the invitation from instructors in a first-year experience course, first-semester students were recruited to take an online survey prior to receiving any information literacy instruction by college librarians. Students were advised of their rights as participants and provided consent to the IRB-approved online survey. Class time was allotted for the survey, taking approximately 15 minutes to complete. Immediately following the survey, librarians conducted a mini lesson, covering most of the critical topics introduced by the survey, as time provided. No incentives were offered to students in exchange for their participation.

To evaluate their information literacy skills and preferences, 21 questions were adapted from other sources to assess source type identification, when to cite, and predicting search outcomes (HEDS, 2019). The survey opened with four demographic questions for participant placement into categories of age, gender identity, class and major. We then asked students to self-rate their ability to critically evaluate information (Nierenberg & Fjeldbu, 2015), and self-rate the levels of challenge associated with components and activities involved in conducting research (HEDS, 2019). Following these, were 18 multiple choice questions that comprise our IL skill assessment. The question answer choices contained one correct answer, four incorrect answers, and a "don't know" response.

3. RESULTS AND DISCUSSION

Raw responses were downloaded from the external survey host and imported into Excel for data cleaning and encoding. Data were encoded for all answer options, by question or survey prompt. Cross-tabulations, reliability and chi-square tests were conducted in SPSS. No identifiable information was recorded, so participants were enumerated by the order displayed in the downloaded file.

3.1. Student Characteristics

Student participants provided basic demographic information about their age, their class membership, gender identity and major. Individual majors were collapsed into four general categories of types of majors. The major type of Professional programs includes Business, Education, and Social Work. The Liberal Arts major type includes Humanities, Social Sciences, Natural Sciences and Mathematics. The STEM/Health major type is comprised of Nursing and Occupational Therapy. All students were within the 18-24-year-old category. Excepting seven transfer students, all were first-semester, first-year students. Table 1 displays both students' gender identity ("How do you identify your gender?") and class membership by their declared major type.

Characteristic	Professional (*n*=55)	Liberal Arts (*n*=53)	STEM/Health (*n*=41)	Exploratory (*n*=10)
Female	32 (58%)	29 (55%)	34 (83%)	8 (80%)
Male	23 (43%)	22 (42%)	7 (17%)	2 (20%)
Non-binary	0 (0%)	0 (0%)	0 (0%)	0 (0%)
(blank)	0 (0%)	2 (4%)	0 (0%)	0 (0%)
Class:				
Freshmen	51 (93%)	50 (94%)	41 (100%)	10 (100%)
Transfer students	4 (7%)	3 (6%)	0 (0%)	0 (0%)

Note: Sums of percentages may not exactly equal 100% due to rounding errors.

Table 1. Student Characteristics as a Percentage of the Sample by Major Type.

3.2. Measuring Student Confidence in Their IL Skills

Two matrix questions and a single rating were aggregated to create a measure of student confidence in their own IL skills. The two matrix questions asked students to rate how challenging they found certain components and activities involved with the research process. Answer choices included very easy, somewhat easy, somewhat difficult, very difficult, and no experience. To explore student ratings, answer choices for very easy and somewhat easy were collapsed into an answer category "easy," and the same method was repeated combining the "difficult" answer choice. Both matrix questions were aggregated and are depicted in Figure 1.

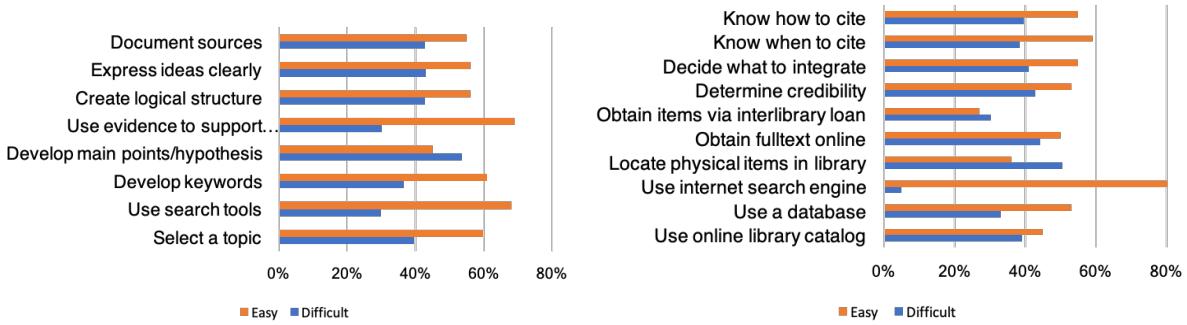

Figure 1. Self-ratings on Challenges of Research Components and Activities.

Overall, students expressed ease of use in largely every research component and activity, with the exceptions of developing main points or hypotheses, obtaining items through interlibrary loans, locating physical items in the library, and using the online library catalog. Fewer than 45% of participants rated these four categories as easy.

A prompt for measuring student confidence in their ability to critically evaluate sources of information followed the Research Components and Activities questions. Answer choices ranged from very good, good, average, poor, to very poor. For comparison, five responses of "don't know" were omitted for an *n* of 154. Students' ratings are displayed in Figure 2. Raw frequencies of answers appear in white over each bar in the graph.

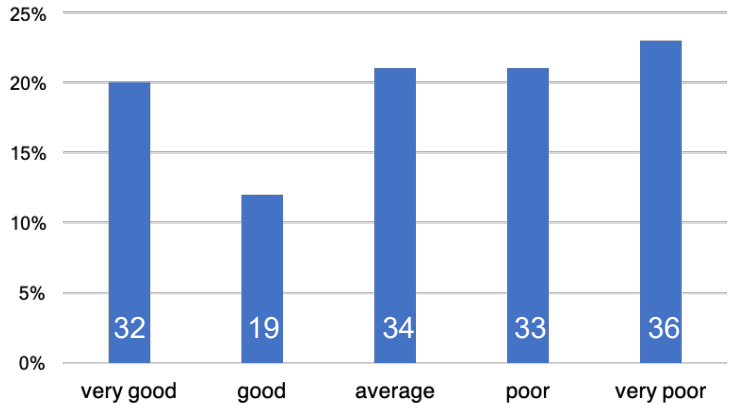

Figure 2. Self-Ratings on Ability to Critically Evaluate Information.

To aggregate the re-encoded measures of student confidence for the self-ratings, a new measure was created. Results of the three self-ratings (challenges with research components and activities, Figure 1), and re-encoded ratings on the ability to critically evaluate information were combined by participant. Re-encodings were necessary to align ratings. Figure 3 illustrates how responses were aligned.

Encoding	Challenge Self-Ratings	Critical Evaluation Self-Ratings
5	very easy	very good
4	somewhat easy	good
3	somewhat difficult	average
2	very difficult	poor, very poor
1	no experience	don't know

Figure 3. Key for Encoding Self-Ratings.

The reliability of this set of ratings was tested, indicating an acceptable level of reliability on this subset of questions (α=.89). Encoding and aggregating self-ratings produced an overall self-ranking of individual confidence in performing various aspects of incorporating IL skills. From a potential total of 95 points, scores of 80% and above were encoded as high self-rank; 60-79% were encoded as medium self-rank; and 59% and below as low self-rank. Table 2 displays the distribution of self-rank scores by major types.

Remarkably, a combined 69% and 21% yields a total of 90% of first-year students who self-ranked their confidence in conducting academic research as medium or high, based on ratings of easy, very good, and average.

Self-rank Level	Professional (*n*=55)	Liberal Arts (*n*=53)	STEM/Health (*n*=41)	Exploratory (*n*=10)	Total (n=159)
Low	5 (9%)	3 (6%)	5 (12%)	3 (30%)	16 (10%)
Medium	40 (73%)	37 (70%)	27 (66%)	5 (50%)	109 (69%)
High	10 (18%)	13 (25%)	9 (22%)	2 (20%)	34 (21%)

Table 2. Distribution of Self-Rank Scores by Major Types.

3.3. Measuring Information Literacy Skills

We utilized the 18-question assessment of information literacy skills to measure students' incoming skills. A binary coding scheme was then created to capture whether students submitted the correct answer (1), or an incorrect (0) or no answer (0). This procedure yielded the potential for an 18-point information literacy scale. The reliability of this set of 18 answers was tested. The resulting Cronbach's alpha coefficient of .85 indicated an acceptable level of test reliability on this subset of questions. Using the same percentage scale of students' scores on the IL skill questions, scores of 80% and above were rated as high accuracy; medium accuracy for scores falling between 60%-79%; and low accuracy for scores below 60%. Table 4 depicts the distribution of IL skill accuracy by major types.

IL Skill Accuracy	Professional (*n*=55)	Liberal Arts (*n*=53)	STEM/Health (*n*=41)	Exploratory (*n*=10)	Total (*n*=159)
Low	41 (75%)	30 (57%)	20 (49%)	10 (100%)	101 (64%)
Medium	12 (22%)	20 (38%)	10 (24%)	0 (0%)	42 (26%)
High	2 (4%)	3 (6%)	11 (27%)	0 (0%)	16 (10%)

Table 3. Distribution of IL Skill Accuracy by Major Types.

To directly compare the self-rank scores from Table 2 to the IL skill accuracy scores from Table 3, a cross-tabulation was created, as displayed in Figure 4 below.

	Low self-rank (*n*=16)	Medium self-rank (*n*=109)	High self-rank (*n*=34)	Total (n=159)
Low IL skills	88% 14	61% 66	62% 21	64% 101
Medium IL skills	13% 2	31% 34	18% 6	26% 42
High IL skills	0	8% 9	21% 7	10% 16

Figure 4. Distribution of IL Skill Accuracy by Self-Ranked Scores.

To understand the distribution of self-ranked scores in comparison with actual performance, we first consider those who are correctly ranked in relationship to accuracy levels (highlighted in blue). Fifty-five students, or 35% of our sample correctly ranked their perceived skill to actual performance. Ninety-three students or 58% of our sample were overconfident (highlighted in orange), and 7% under-rated their individual confidence in performing various aspects of incorporating IL skills (highlighted in yellow).

Gross and Latham (2012) report student overconfidence, based on students' estimates of their own scores against the anticipated scores of their peers. Similar to the current study, Gustavson and Nall (2011) compared students' predictions of their IL skill to scores of correct responses to library research questions and reported an underwhelming .12 correlation between test scores and self-reported confidence (pg. 299). Molteni and Chan (2015) also note that confidence is not a reliable predictor of proficiency. Their survey instrument prompted confidence ratings (Excellent to Poor) by separate descriptions of specific tasks. These conclusions suggest that undergraduate student confidence and preparation levels should be viewed in proportion to actual performance on IL skills.

Based on these particular students, which areas of underperformance should inform IL instruction? To answer this question, a chi-square analysis for students' IL score for each

question was conducted. Figure 5 displays student performance by question.

		Low IL skills		Medium IL skills		High IL skills		All		
		inc	correct	inc	correct	inc	correct	inc	correct	X^2
source type	popular magazine vs scholarly article	88	13	32	10	7	9	127	32	*16.65
	aspects of peer-reviewed/ refereed	64	37	12	30	2	14	78	81	*23.88
	citation definition	83	18	34	8	9	7	126	33	5.75
source type: primary vs secondary	autobiography	37	64	3	39	0	16	40	119	*19.68
	biography	60	41	10	32	0	16	70	89	*29.25
	book review	20	81	3	39	2	14	25	134	3.73
	fictional novel	88	13	26	16	8	8	122	37	*17.69
	lab report	12	89	2	40	0	16	14	145	3.59
	scholarly article analyzing fiction	51	50	7	35	1	15	59	100	*21.80
source type: identify by citation	journal volume and issue	67	34	9	33	4	12	80	79	*28.49
	journal vs book or book chapter (3 questions)	84	17	26	16	3	13	113	46	*30.21
		75	26	18	24	1	15	94	65	*32.68
		78	23	14	28	2	14	94	65	*39.65
search strategies	relevance	25	76	1	41	0	16	26	133	*14.33
	truncation	46	55	17	25	3	13	66	93	4.11
	by reference list	77	24	18	24	2	14	97	62	*31.49
	boolean operator	81	20	18	24	5	11	104	55	*27.46

*$p < .01$

Figure 5. Chi-square Analysis by Question, by Student Performance.

Questions with a significant X^2 means that the questions are very likely dependent on

one's IL skill score: One's IL skill level is highly associated with whether or not questions were answered correctly. Orange shading highlights those questions with greater numbers of incorrect responses; red shading is used to accentuate where most students struggled with understanding. While this snapshot may be isolated to these individual students, it can also provide a glimpse of how students with low IL levels compare to those in the medium and high levels. While we do not suggest that library instruction topics should be cherry-picked, this analysis does helps us differentiate between skill levels and for guiding IL instruction.

Most first-year students (64%) in this study failed an IL skills test, but a small minority evidenced IL preparation adequate to the rigor of higher education. While exemplary performance was not expected, the high number of students who were overconfident in their self-rankings should have been expected, given the attention paid to this phenomena in the literature. The 58% rate of those who over-rated their performance suggests a background low in information literacy skill acquisition. Like the Dunning-Kruger effect, low levels of preparation can lead to a tendency to disregard additional instruction or assistance, self-satisfaction with low performance levels, and ultimately an inability to assess and use information systems (Gross, et. al., 2012).

Limitations to this study culminate from the study's exploratory nature and from the specific population of students attending a small liberal arts college. We were not sure what we would learn, and thus our IL skills testing included only baseline measurements. Certainly, keyword generation, the filtering/sorting of results, and exposure to library services should also be included in first-year student IL instruction.

4. CONCLUSION

Particularly in our age of mass propaganda and misinformation campaigns, the importance of information literacy instruction is as critical as ever. The inherent message from the results of this survey for library instruction today is that most students enter college without sufficient skills to participate in college-level coursework (Lanning & Mallek, 2017). Acknowledging this will help librarians prepare for IL instruction. By designing instruction that attends to students' lack of awareness and preparation, we can meet students where they are (Insua, et. al., 2018). For example, we suggest framing instruction to first-year cohorts acknowledging they are meeting new expectations and with new resources, and need to develop different skills. We further recommend the assessment of student confidence coupled with the assessment of actual performance. Sharing the results with the students themselves may also help them recognize and accept their novice status within a new informational environment. Furthermore, we are developing self-guided tutorials for problem areas identified by this analysis: Understanding source types and documentation, and developing database search strategies. More recent work suggests that by incorporating metacognitive strategies in IL instruction helps students overcome uncertainty and improve engagement, beyond providing mere "database demonstrations" (Chisholm & Spencer, 2019).

For new librarians, this study also provides a method for employing a simple pre- and post- survey of IL assessment, without incurring the formality of a full study. By incorporating an online poll for students to rate their perceived challenges of activities and components of research, for example, IL instruction can be modified to suit the preparation levels of a first-year

audience. Librarians are limited by the availability of assessment tools, and these low-level methods of assessment can help an academic library empirically demonstrate its value in support of the academic mission and throughout a student's academic lifecycle.

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